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(54) **VIRTUAL ATTRACTION CONTROLLER**

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(58) **Field of Classification Search**

CPC ... G05D 1/0022; G05D 1/0027; A63G 31/00

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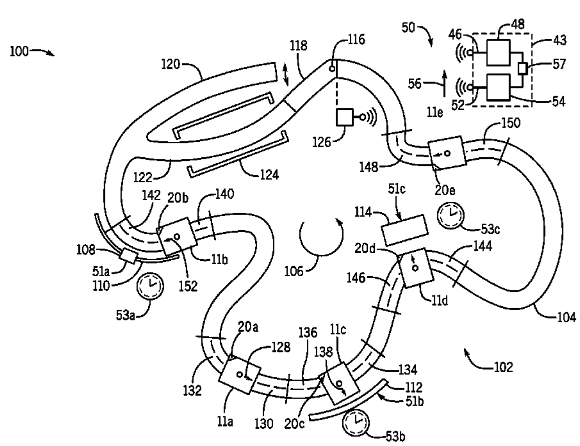
(57) **ABSTRACT**

A ride control system includes a plurality of ride vehicles positioned within a course and configured to travel within the course. Each of the plurality of ride vehicles includes a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles. Each of the plurality of ride vehicles also includes a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course. Each of the plurality of ride vehicles further includes a vehicle transceiver in communication with the vehicle controller. The ride control system also includes a primary controller and a primary transceiver in communication with the primary controller. The ride control system further includes a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles. The primary controller is configured to receive data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network. The primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on the data indicative of the location of each of the plurality of ride vehicles.

20 Claims, 3 Drawing Sheets



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B61L 15/00	(2006.01)
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B61L 25/02	(2006.01)
B61L 27/00	(2006.01)

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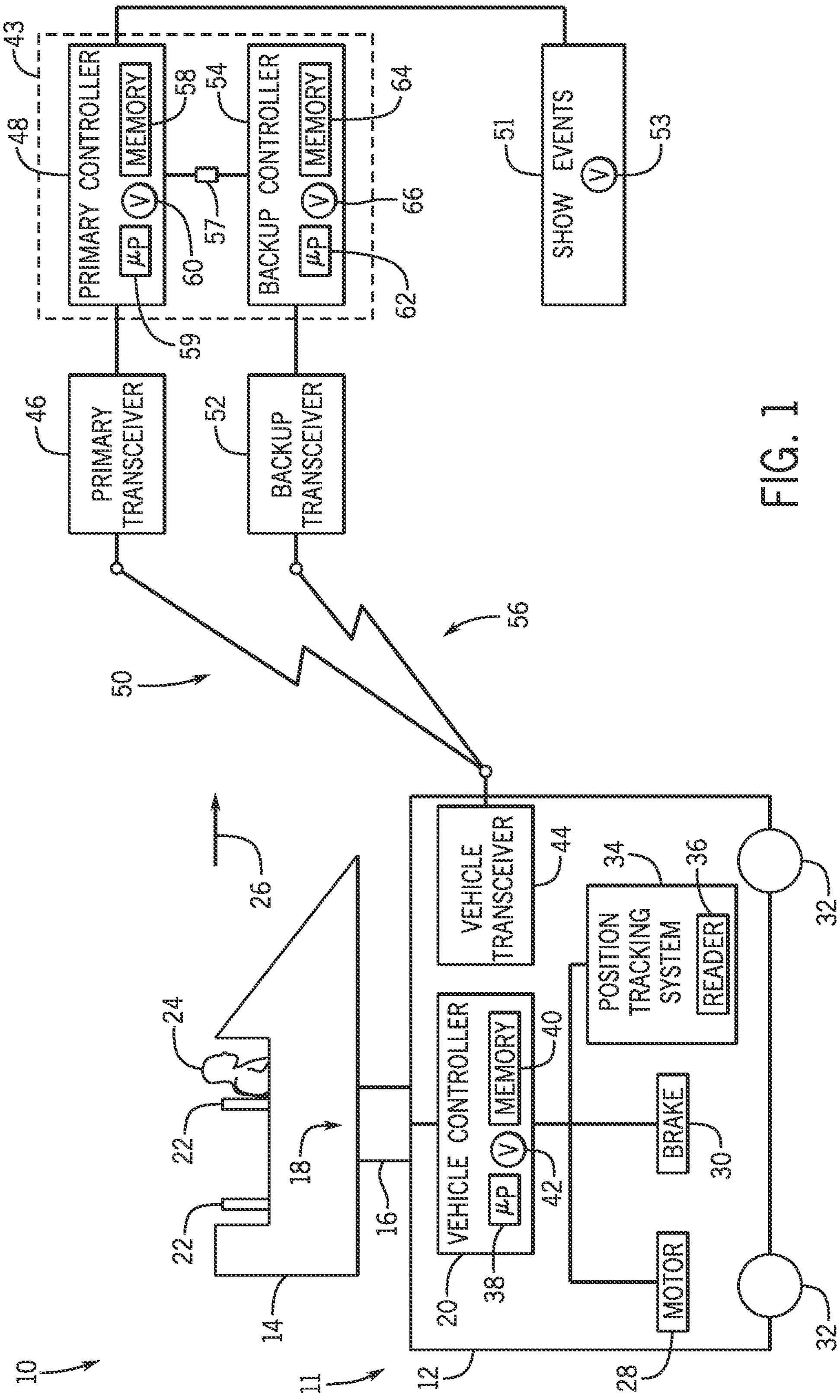
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BACKUP CONTROLLER
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SHOW EVENTS
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PRIMARY TRANSCEIVER
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VEHICLE TRANSCEIVER
VEHICLE CONTROLLER
MEMORY
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POSITION TRACKING SYSTEM
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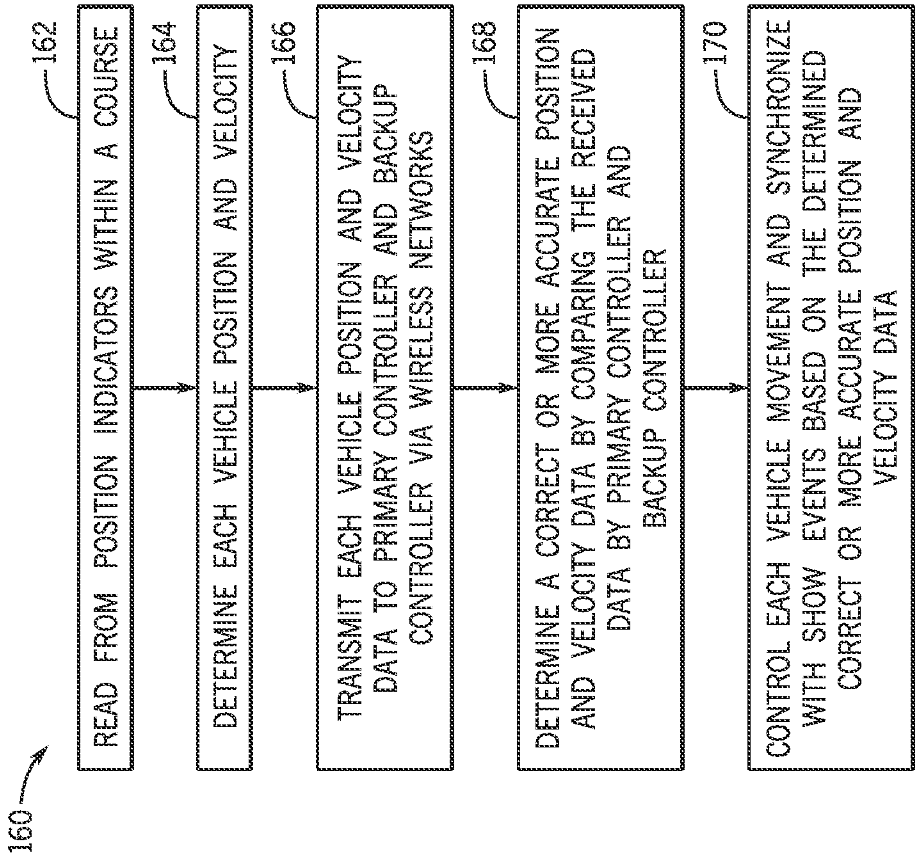
FIG. 1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162
READ FROM POSITION INDICATORS WITHIN A COURSE
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DETERMINE EACH VEHICLE POSITION AND VELOCITY
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TRANSMIT EACH VEHICLE POSITION AND VELOCITY DATA TO PRIMARY CONTROLLER AND BACKUP CONTROLLER VIA WIRELESS NETWORKS
168
DETERMINE A CORRECT OR MORE ACCURATE POSITION AND VELOCITY DATA BY COMPARING THE RECEIVED DATA BY PRIMARY CONTROLLER AND BACKUP CONTROLLER
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CONTROL EACH VEHICLE MOVEMENT AND SYNCHRONIZE WITH SHOW EVENTS BASED ON THE DETERMINED CORRECT OR MORE ACCURATE POSITION AND VELOCITY DATA

FIG. 4

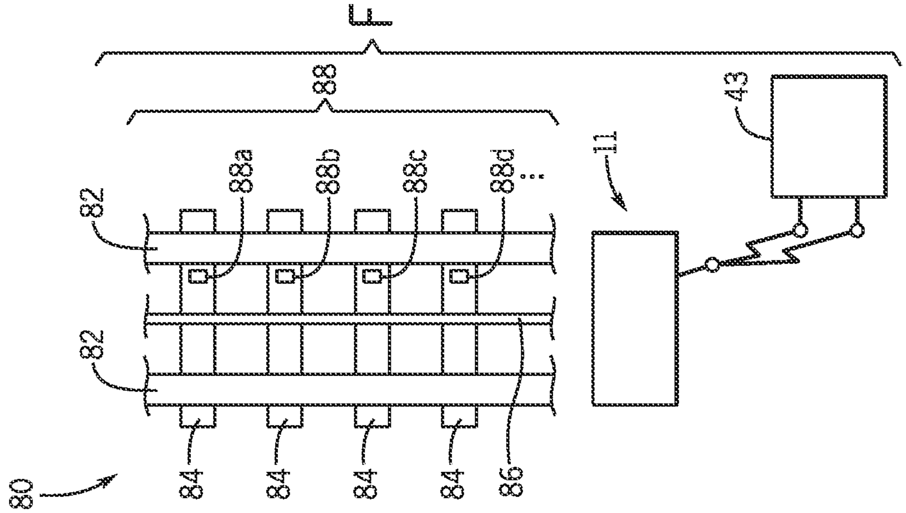
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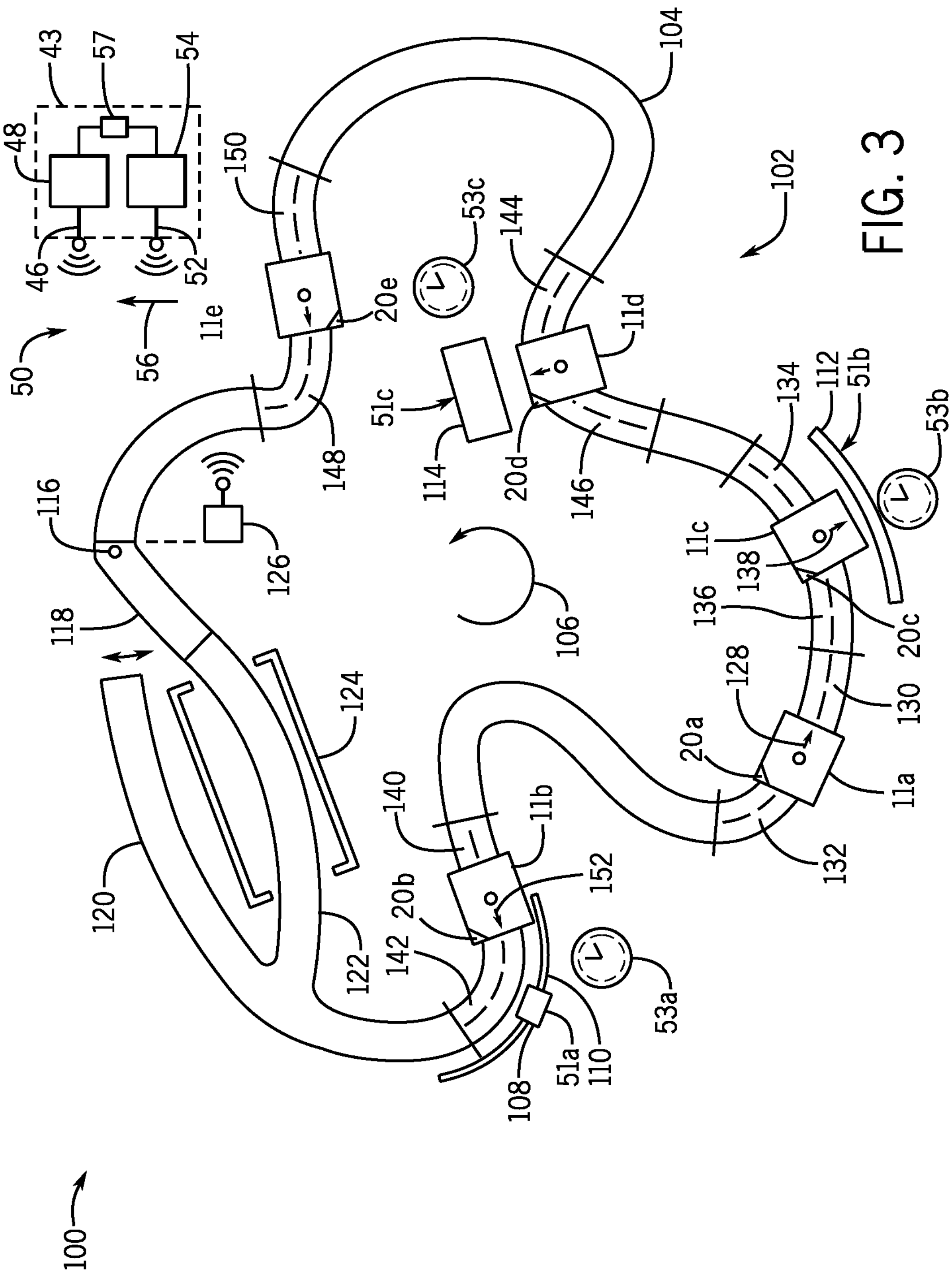
FIG. 2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134
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51b
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116
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11c
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11a
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11b
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120
152
20b
122
142
53a
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51a
110
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FIG. 3

VIRTUAL ATTRACTION CONTROLLER

BACKGROUND

The present disclosure relates generally to a system and method for controlling an attraction and, more particularly, to a system and method for controlling motion of a vehicle or a show event in an attraction course.

Theme park or amusement park ride attractions have become increasingly popular. Amusement park rides often include traveling rides, which include ride vehicles that travel along a path (e.g., a railway or a track), fixed rides, which may include a motion base, or combinations thereof. The path of a traveling ride may be situated in different surroundings (e.g., on a mountain top, in a tunnel, under the water). Along the path, there may be different types of show events, such as moving action figures (e.g., animatronics), video screen projections, sound effects, water effects, and so forth. In fixed rides, a movable passenger platform having multiple degrees of freedom is typically situated on a relatively still base. The passenger platform can move in several different directions including angular movements, such as roll, pitch and yaw, and linear movements, such as heave and surge. The passenger platform is also frequently positioned adjacent one or more projection screens showing a series of images or a motion picture. For added realism and effect, the movement of the passenger platform can be synchronized with the projected images or motion picture.

Controlling and monitoring of amusement park rides are generally carried out using a central controller or computer. For example, the central controller may monitor each ride vehicle's position on an associated path and when vehicle spacing is within a predetermined minimum distance, all ride vehicles on the path may be stopped. The central controller may also trigger show events, such as video screen projections, based on ride vehicle positioning. Such control systems often include multiple sensors mounted at various locations along the path with complex wiring for connecting each sensor to the central controller. It is now recognized that such traditional control systems can be costly to maintain and difficult to integrate.

BRIEF DESCRIPTION

Certain embodiments commensurate in scope with the originally claimed subject matter are summarized below. These embodiments are not intended to limit the scope of the disclosure, but rather these embodiments are intended only to provide a brief summary of certain disclosed embodiments. Indeed, the present disclosure may encompass a variety of forms that may be similar to or different from the embodiments set forth below.

In accordance with one aspect of the present disclosure, a ride control system includes a plurality of ride vehicles positioned within a course and configured to travel within the course. Each of the plurality of ride vehicles includes a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles. Each of the plurality of ride vehicles also includes a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course. Each of the plurality of ride vehicles further includes a vehicle transceiver in communication with the vehicle controller. The ride control system also includes a primary controller and a primary transceiver in communication with the primary controller. The ride control system further includes a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles. The primary controller is configured to receive data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network. The primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on the data indicative of the location of each of the plurality of ride vehicles.

In accordance with another aspect of the present disclosure, a ride control system includes a plurality of ride vehicles positioned within a course and configured to travel within the course. Each of the plurality of ride vehicles includes a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles. Each of the plurality of ride vehicles also includes a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course. Each of the plurality of ride vehicles further includes a vehicle transceiver in communication with the vehicle controller. The ride control system also includes a primary controller and a primary transceiver in communication with the primary controller. The ride control system further includes a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles. The primary controller is configured to receive a first set of data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network. The ride control system still includes a backup controller in communication with the primary controller and a backup transceiver in communication with the backup controller. The ride control system also includes a backup wireless network formed by the vehicle transceiver and the backup transceiver to include at least the backup controller and the vehicle controller of each of the plurality of ride vehicles. The backup controller is configured to receive a second set of data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the backup wireless network. The ride control system further includes a bi-directional voting circuit configured to compare the first set of data and the second set of data, and to select between the first set of data and the second set of data. The primary controller or the backup controller, and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on one of the first set or the second set of data indicative of the location of each of the plurality of ride vehicles.

In accordance with another aspect of the present disclosure, a method for controlling a plurality of ride vehicles within a course includes identifying a location of each of the plurality of ride vehicles. The method also includes transmitting the location of each of the plurality of ride vehicles to a system controller via a primary wireless network. The primary wireless network includes the system controller and a vehicle controller of each of the plurality of ride vehicles. The method further includes transmitting the location of each of the plurality of ride vehicles to a backup controller via a backup wireless network. The backup wireless network includes the backup controller and a vehicle controller of each of the plurality of ride vehicles. The method still includes selecting one selected location from the location received by the system controller and the location received by the backup controller with a bi-directional circuit. The method also includes controlling, with the system controller, a movement of each of the plurality of ride vehicles based on the one selected location.

DRAWINGS

These and other features, aspects, and advantages of the present disclosure will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

FIG. **1** is a schematic representation of an embodiment of a ride control system in accordance with the present disclosure;

FIG. **2** is a plan view of a track upon which a ride vehicle may travel in accordance with an embodiment of the present disclosure;

FIG. **3** is a schematic representation of a ride control system including five ride vehicles traveling along a course in accordance with an embodiment of the present disclosure; and

FIG. **4** is a block diagram of a method for monitoring and controlling a plurality of vehicles in a course.

DETAILED DESCRIPTION

The present disclosure provides a ride control system including a plurality of ride vehicles positioned within a course and configured to travel within the course. Each of the plurality of ride vehicles includes a vehicle controller configured to control movement of the respective ride vehicle. The movement of each ride vehicle may include external movements, such as running and stopping of the ride vehicle in the course, and internal movements, such as rotation and tilting of a passenger platform with respect to a base of the ride vehicle. Each of the plurality of ride vehicles also may include a position tracking system configured to facilitate identification of a location of the respective ride vehicle within the course. Each vehicle controller is connected to a vehicle transceiver.

The ride control system also includes a system controller that includes a primary controller and a backup controller. The primary controller is connected to a primary transceiver. A primary wireless network is formed by the primary transceiver and the plurality of vehicle transceivers. Thus, the primary wireless network includes the primary controller and the plurality of vehicle controllers. Via the primary wireless network, the primary controller may receive data indicative of the status (e.g., position and velocity) of each of the plurality of ride vehicles, and, based on the received data, send instructions to adjust the movement of the respective ride vehicle. For example, the primary controller, upon receiving data indicating a first ride vehicle is approaching a second ride vehicle at an excessive speed, may direct the first ride vehicle to decelerate or stop.

In addition, the primary controller, in some embodiments, is connected to and controls operations of one or more show events within the course. The show events may include video projection of images or motion pictures, performance of action figures or cartoon characters, sound effects, or the like. Based on the received data indicative of the status (e.g., position and velocity) of each of the plurality of ride vehicles, the primary controller may send instructions to the respective ride vehicle and/or the show events to synchronize the movement of the respective ride vehicle with the show events. For example, the primary controller may trigger a show event earlier when a ride vehicle travels toward the show event at a higher speed. Also, for example, the primary controller may send instructions to the ride vehicle to adjust its speed of traveling and rotation of the seat to synchronize with different show elements of the show event.

In accordance with the present disclosure, the primary controller monitors and controls each of the plurality of ride vehicles independently. For example, the primary controller may control the running and stopping of each of the plurality of ride vehicles independently. The primary controller may direct one ride vehicle to bypass the main path to enter a maintenance station while keeping other ride vehicles running on the main path. The primary controller may set independent show event clocks of a show event with respect to different ride vehicles and adjust the movement of the ride vehicles to synchronize with the corresponding show event clocks.

Furthermore, in accordance with the present disclosure, the system controller of the ride control system may also include the backup controller with an associated backup transceiver. The backup transceiver and the plurality of vehicle transceivers form a backup wireless network. Via the backup wireless network, the backup controller monitors the position and velocity of each of the plurality of the ride vehicles in addition to, and independent of, the primary controller. Thus, the backup controller can be utilized to provide independent data for added accuracy or robustness of position monitoring of the plurality of ride vehicles. In case of failure of the primary controller or the primary wireless network, the backup controller may control the movement of the plurality of ride vehicles.

Moreover, the ride control system may monitor the performance degradation of each of the plurality of ride vehicles by recording operational status factors, such as velocity or motor output, over a period of time. This allows for prediction of maintenance status of each of the plurality of ride vehicles. Furthermore, the ride control system in accordance with the present disclosure may also calculate virtual blocking zones of each of the plurality of ride vehicles, thereby removing physical breaks between zones of the course. For example, based on the received data indicative of position and velocity of each of the plurality of ride vehicles, the primary controller may calculate virtual blocking zones around (e.g., in front of, in back of) the respective ride vehicles. Once the calculated virtual blocking zones for different ride vehicles start to overlap, the primary controller may direct one or more of the ride vehicles to adjust their movement (e.g., to slow down or stop) to avoid collision.

With the foregoing in mind, FIG. **1** illustrates a schematic representation of an embodiment of a ride control system **10** in accordance with the present disclosure. The ride control system **10** includes a plurality of ride vehicles (e.g., a vehicle **11**) positioned within a course and configured to travel within the course. The course may include an open space, a playground, or a path (e.g., a railway or a track). The vehicle **11** includes a base **12** and a passenger platform **14** (e.g., a passenger seating area) on top of the base **12**. An actuator **16**, which may represent multiple actuators, connects the base **12** and the passenger platform **14** about a central region **18** of the passenger platform **14**. A vehicle controller **20** controls the actuator **16** to impart motion in multiple degrees of freedom on the passenger platform **14**. Such internal motion of the passenger platform **14** with respect to the base **12** may include angular movements, such as roll, pitch and yaw, and linear movements, such as heave and surge. The actuator **16** may be any suitable type actuator for providing motion, including, but not limited to, electrical, hydraulic, pneumatic, mechanical, or any combination thereof. In some embodiments, the actuator **16** represents a set of multiple actuators that connect the base **12** and the passenger platform **14** and provide motion of the passenger platform in multiple degrees of freedom.

In the illustrated embodiment, the passenger platform **14** includes one or more seats **22** on which one or more passengers **24** may sit. The vehicle **11** moves within the course in a general direction, illustrated by an arrow **26**. One or more show events, as discussed in greater detail below, may be disposed within the course. When the vehicle **11** moves in the direction **26** and approaches a show event, the show event may be triggered, and the passenger **24** may view, listen to, and/or interact with the show event. For added realism and effect, the show event may be synchronized with the movement of the passenger platform **14**. For example, the passenger platform **14** may be rotated with respect to the direction **26** to facilitate viewing the show event as the vehicle **11** passes the show event. The passenger platform **14** may also, for example, tilt to simulate a turn motion of the vehicle **11** as the show event is displaying a car making a turn.

To provide external movements of the vehicle **11**, the vehicle **11** includes a motor **28** and a brake **30**. In some embodiments, the vehicle **11** may include a steering device, such as a steering wheel. The external movements of the vehicle **11** may include running (e.g., acceleration, deceleration), stopping, and steering of the vehicle **11**. The motor **28** may be powered by any suitable power source, including, but not limited to, a battery, a solar panel, an electrical generator, a gas engine, or any combination thereof. The brake **30** may be mounted to one or more wheels **32** of the vehicle **11**. The operations of the motor **28** and the brake **30** may be controlled by the vehicle controller **20**. For example, the vehicle controller **20** may control the motor **28** to adjust its output power to accelerate or decelerate the vehicle **11**. The vehicle controller **20** may also control the brake **30** to apply certain amount of force on the wheels **32** to decelerate or stop the vehicle **11**. In some embodiments, the steering device may also be controlled by the vehicle controller **20**.

The vehicle **11** includes a position tracking system **34** for monitoring its position within the course. As discussed in greater detail below, a plurality of position indicators may be disposed in the course. Each position indicator represents a unique location (e.g., coordinates relative to one or more reference points) within the course. The vehicle position tracking system **34** includes a reader **36**. As the vehicle **11** travels in the course and is near a position indicator, the reader **36** may sense the position indicator to provide the position information of the vehicle **11**. The reader **36** then supplies the position information to the vehicle controller **20**.

The vehicle controller **20** includes various components that may allow for operator interaction with the vehicle **11**. The vehicle controller **20** may include an automation controller or set of automation controllers, such as a distributed control system (DCS), a programmable logic controller (PLC), or any computer-based device that is fully or partially automated. For example, the vehicle controller **20** may be any device employing a general purpose or an application-specific processor **38**. The vehicle controller **20** may also include a memory **40** for storing instructions executable by the processor **38** to perform the methods and control actions described herein for the vehicle **11**. The processor **38** may include one or more processing devices, and the memory **40** (e.g., a hard drive) may include one or more tangible, non-transitory, machine-readable media. By way of example, such machine-readable media can include RAM, ROM, EPROM, EEPROM, CD-ROM, or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by the processor **38** or by any general purpose or special purpose computer or other machine with a processor. While certain example embodiments are described herein as being operable to perform functions with the vehicle controller **20** (e.g., the processor **38**), it should be noted that such functions may be performed by the primary controller **48** and/or cooperatively performed by the primary controller **48** and the vehicle controller **20**.

The vehicle controller **20** also includes a vehicle clock **42** (e.g., a software clock application) that operates to provide timing information for operations of the vehicle controller **20**. For example, the vehicle clock **42** may time stamp when the vehicle controller **20** sends instructions to the motor **28** to accelerate the vehicle **11**, or to the brake **30** to stop the vehicle **11**. The vehicle clock **42** may also time stamp when the reader **36** reads position information of the vehicle **11**. The memory **40** of the vehicle controller **20** stores the position data provided by the reader **36** and the corresponding timing data provided by the vehicle clock **42**. For example, the memory **40** may store the position of the vehicle **11** at a specific time and/or during a period of time. The processor **38** may then access the memory **40** for the stored position and timing data and calculate a velocity of the vehicle **11** at any specific time and/or an average velocity during a period of time. The calculated velocity information may also be stored in the memory **40**.

The processor **38** of the vehicle controller **20** may also calculate or otherwise establish (e.g., receive from a central controller, such as the primary controller **48**) a blocking zone of the vehicle **11** and may likewise identify (e.g., calculate or receive) respective blocking zones for other vehicles on the course. These blocking zones may be described as regions surrounding the respective vehicles (e.g., vehicle **11**). If the blocking zone for the vehicle **11** is found to overlap with the blocking zone of another vehicle within the course, the system **10** may take precautions to avoid interference between the two vehicles and the associated distraction of the riders **24** from the desired ride experiences. For example, in determining the blocking zone for vehicle **11** the processor **38** or the system controller **48** may determine, based on the current velocity and loading condition of the vehicle **11**, a stopping distance in which the vehicle **11** would come to a full stop with a specific deceleration (e.g., a pre-determined value, or with full force of the brake **30**).

The blocking zone may be demarcated as a boundary (e.g., a circle) around the vehicle **11**. In one embodiment, the boundary is a circle with the radius of the determined stopping distance in a particular direction. In one embodiment, the boundary may be demarcated as regions (e.g., in front of and behind the vehicle **11**) on the path that would establish a desired buffer zone based on measured values associated with the vehicle **11** (e.g., speed) and/or other vehicles. In accordance with the present disclosure, the blocking zone of the vehicle **11** is dynamic because the area of the blocking zone may be adjusted in essentially real-time based on the velocity and position of the vehicle **11**. Thus, the blocking zone, which is defined relative to the vehicle **11**, moves as the vehicle **11** moves in the course. The size of a blocking zone may also be dynamically adjusted based on a location within a course. For example, it may be desirable to extent blocking zones of vehicles in one or more directions within a particular portion of a course to avoid line of sight between vehicles, which may achieve a desired effect or ride atmosphere (e.g., the perception of being isolated).

The processor **38** of the vehicle controller **20** may also determine a loading condition (e.g., weight of all passengers in the vehicle **11**) of the vehicle **11**. In one embodiment, the vehicle **11** includes a weight sensor in the passenger platform **14**. The weight sensor is configured to sense the weight of all passengers and send the weight data to the vehicle controller **20**. In another embodiment, the vehicle controller **20** determines the loading condition based at least on the motor output power and the traveling velocity of the vehicle **11**. For example, when the vehicle **11** has a lighter load (e.g., two children riding the vehicle **11** compared to two adults riding the vehicle **11**), the motor may have a lower output power to maintain the vehicle at a certain velocity, or the vehicle **11** may accelerate faster to reach a certain velocity with a certain output power. Thus, by recording the velocity change along with the motor output power change, the vehicle controller **20** may determine the weight of all passengers in the vehicle **11**.

The ride control system **10** includes a system controller **43** to monitor and control the movement of the vehicle **11**. The system controller **43** includes a primary controller **48** and a backup controller **54**. The vehicle **11** includes a vehicle transceiver **44** (e.g., may represent a primary vehicle transceiver and a backup vehicle transceiver) that is connected to the vehicle controller **20**. The vehicle transceiver **44** communicates wirelessly with a primary transceiver **46** that is connected to the primary controller **48**. Therefore, the vehicle controller **20**, through the vehicle transceiver **44**, is wirelessly connected to the primary controller **48** through the primary transceiver **46**. Accordingly, a primary wireless network **50** is created containing at least the primary controller **48** and the vehicle controller **20**. As the plurality of the ride vehicles are positioned in the course, each vehicle controller **20** with a vehicle transceiver **44** of the respective ride vehicle of the plurality of ride vehicles may be connected to the primary controller **48** through the primary transceiver **46**. Accordingly, the primary wireless network **50** may contain the primary controller **48** and the plurality of vehicle controllers **20**.

Data is transferred between the primary controller **48** and the vehicle controller **20** via the primary wireless network **50**. The vehicle controller **20** may transfer data indicative of the status of the vehicle to the primary controller **48**. Such data may include the vehicle identifier, position, velocity, dynamic blocking zone, traveling direction, motor output power, loading condition, or the like. Based on the received data from the vehicle controller **20**, the primary controller **48** may send instructions to the vehicle controller **20** to control the movement of the vehicle **11**. For example, the primary controller **48** may compare the dynamic blocking zones of all ride vehicles in the course to determine if any of the ride vehicles are likely to interfere with one another based on their traveling velocities, current positions, and traveling directions. If so, the primary controller **48** may, for example, send instructions to a second ride vehicle that is behind a first ride vehicle to decelerate or stop. In accordance with the present disclosure, the primary controller **48** controls each of the plurality of ride vehicles independently. Thus, in the above example, while the primary controller **48** sends the instructions to the second ride vehicle to decelerate or stop, the primary controller **48** may simultaneously send the instructions to the first ride vehicle to accelerate, or maintain the current velocity, or even decelerate or stop as long as the dynamic blocking zones of the two ride vehicles are determined not to overlap.

In accordance with certain embodiments, the primary controller **48** is also connected to, and controls the operations of, one or more show events **51** in the course. The show event **51** may include video elements (e.g., projection of images or a motion picture), sound effects, moving elements (e.g., flying of an action figure, eruption of a volcano), animatronics (e.g., a walking dinosaur), or any combination thereof. It is contemplated that any suitable show events that may be controlled by a controller may be included in the course. The show event **51** may include a show clock **53**. The show clock **53** may time stamp one or more (e.g., all) show elements of the show event **51** as the show event **51** plays. For example, the show clock **53** may time stamp certain images of a sequence of images, certain frames of a motion picture, certain movements in a sequence of movements of an animatronic figure, or the like. In some embodiments, the show clock **53** is integrated with the primary controller **48** instead of the show event **51**.

In accordance with the present disclosure, the primary controller **48** may, based on the received data indicative of the status of the vehicle **11**, send instructions to the vehicle controller **20** and/or the show event **51** to synchronize the movement of the vehicle **11** with the event **51**. For example, the primary controller **48**, upon receiving data indicative of a higher traveling velocity of the vehicle **11** from the vehicle controller **20**, may trigger the show event **51** to start earlier as the vehicle **11** approaches the show event **51**. Conversely, the primary controller **48** may trigger the show event **51** to start later upon receiving data indicative of a lower traveling velocity of the vehicle **11**. Also, the primary controller **48** may synchronize the internal movements of the vehicle **11** (e.g., rotation, tilting of the passenger platform **14**) with particular show elements of the show event **51**. If, for example, the primary controller **48** receives data indicative of a higher traveling velocity of the vehicle **11** from the vehicle controller **20**, the primary controller **48** may send instructions to the show event **51** to correspondingly increase the playing speed of the show elements and increase the speed of the internal movements of the vehicle **11**, or may send instructions to the vehicle controller **20** to decelerate the vehicle **11** to a matching traveling velocity and decrease the internal movements of the vehicle **11** with regard to the playing speed of the show elements.

In addition to wirelessly communicating with the primary transceiver **46**, the vehicle transceiver **44** communicates wirelessly with a backup transceiver **52**. In some embodiments, a separate vehicle transceiver (e.g., rather than the vehicle transceiver **44**) may be connected to the vehicle controller **20** and may communicated wirelessly with the backup transceiver **52**. The backup transceiver **52** is connected to the backup controller **54** of the system controller **43**. Therefore, the vehicle controller **20**, through the vehicle transceiver **44**, is wirelessly connected to the backup controller **54** through the backup transceiver **52**. Accordingly, a backup wireless network **56** is created containing at least the backup controller **54** and the vehicle controller **20**. When more than one vehicle **11** is positioned in the course, the backup wireless network **56** may contain the primary controller **48** and a plurality of vehicle controllers **20**. The backup wireless network **56** may operate at a same communication frequency as, but preferably a different communication frequency from, the primary wireless network **50**.

Similar to the primary wireless network **50**, data may be transferred between the vehicle controller **20** and the backup controller **54** and via the backup wireless network **56**. The vehicle controller **20** may transfer data indicative of the status of the vehicle to the backup controller **54**. Such data may include the vehicle identifier, position, velocity, dynamic blocking zone, traveling direction, motor output power, loading condition, or the like. In some embodiments, the backup controller **54**, independent of the primary controller **48**, may, based on the received data from the vehicle controller **20**, send instructions to the vehicle controller **20** to control the movement of the vehicle **11**. In addition, the backup controller **54**, independent of the primary controller **48**, may send instructions to the vehicle controller **20** and/or the show event **51** to synchronize the movement of the vehicle **11** with the event **51**.

As noted above, while certain data (e.g., position, velocity, dynamic blocking zone, traveling direction, motor output power, loading condition, or the like) of the vehicle **11** may be calculated or otherwise obtained by the vehicle controller **20** (e.g., the processor **38**), it should be noted that such data may be calculated or otherwise obtained by the primary controller **48**, the backup controller **54**, cooperatively by the primary controller **48** and the vehicle controller **20**, and/or cooperatively by the backup controller **48** and the vehicle controller **20**.

The system controller **43** includes a bi-directional voting circuit **57** that connects the backup controller **54** and the primary controller **48**. The bi-directional voting circuit **57** is configured to compare the position and velocity data of the vehicle **11** received by the primary controller **48** (via the primary wireless network **50**) and the backup controller **54** (via the backup wireless network **56**). The two sets of data (e.g., position data, velocity data) may have discrepancy due to some errors that may occur in one of the wireless networks **50**, **56** or one of the controllers **48**, **54**. For example, one of the wireless networks **50**, **56** may receive interference during data transmission, or one of the controllers **48**, **54** may experience system malfunctions at some moment. The bi-directional voting circuit **57** may determine, based on, for example, a pre-stored algorithm, which set of data (e.g., position data or velocity data) is more accurate. This may include a comparison of current data with historical data. Based on the more accurate data of the vehicle **11**, the system controller **43** may send instructions to the vehicle controller **20** to control the movement of the vehicle **11**. In some embodiments, the primary controller **48** sends consequent instructions to the vehicle controller **20** regardless of which data (e.g., data received by the primary controller **48** or by the backup controller **54**) is determined to be more accurate. Only in certain situations (e.g., communication via the primary wireless network **50** is lost, or the primary controller **48** is down), the backup controller **54** may send instructions (e.g., stopping the vehicle **11**) to the vehicle controller **20** via the backup wireless network **56**. The backup controller **54**, however, is not configured to trigger or control the one or more show events **51**. In other embodiments, whichever controller (e.g., the primary controller **48** or the backup controller **54**) is determined to have received the more accurate data may send consequent instructions to the vehicle controller **20**. In these embodiments, the primary controller **48** and the backup controller **54** work independently, but complimentary to each other (e.g., at any time only one controller functions), to control the movement of the vehicle **11** and to synchronize the movement of the vehicle **11** with the event **51**.

In some embodiments in accordance with the present disclosure, the system controller **43** may include more than two controllers (e.g., the primary controller **48** and the backup controller **54**). For example, the system controller **43** may include one primary controller (e.g., the primary controller **48**) and two or more (e.g., 2, 3, 4, 5, 6, or more) backup controllers (e.g., the backup controller **54**) for added robustness, accuracy, and security. Accordingly, a multi-directional (e.g., 3, 4, 5, 6, 7, or more-directional) voting circuit may be used to connect the more than two controllers. Similarly, the multi-directional voting circuit may be configured to compare the data of the vehicle **11** received from the more than two controllers.

The primary controller **48** includes various components that may allow for operator interaction with the primary wireless network **50** and the vehicle **11**. The primary controller **48** may include a distributed control system (DCS), a programmable logic controller (PLC), or any computer-based automation controller or set of automation controllers that is fully or partially automated. For example, the primary controller **48** may be any device employing a general purpose or an application-specific processor **59**. The primary controller **48** may also include a memory **58** for storing instructions executable by the processor **59** to perform the methods and control actions of the system including the primary wireless network **50** and the vehicle **11**. The processor **59** may include one or more processing devices, and the memory **58** may include one or more tangible, non-transitory, machine-readable media. By way of example, such machine-readable media can include RAM, ROM, EPROM, EEPROM, CD-ROM, or other optical disk storage, magnetic disk storage or other magnetic storage devices, or any other medium which can be used to carry or store desired program code in the form of machine-executable instructions or data structures and which can be accessed by the processor **59** or by any general purpose or special purpose computer or other machine with a processor.

The primary controller **48** also includes a primary clock **60** to provide timing information of various operations of the primary controller **48**. For example, the position information of the vehicle **11** may be transferred from the vehicle controller **20** to the primary controller **48** via the primary wireless network **50**, and the primary clock **60** may time stamp when such position information is collected by the reader **36**. Thus, the velocity of the vehicle **11** at a specific time and/or during a period of time may be calculated by the processor **59** of the primary controller **48**, additionally or alternatively, by the processor **38** of the vehicle controller **20**. The primary clock **60** may be synchronized with the vehicle clock **42**, or may run independently of the vehicle clock **42**. In some embodiments, the primary clock **60** may also be used as the show clock **53**.

Similar to the primary controller **48**, the backup controller **54** also includes a processor **62**, a memory **64**, and a backup clock **66**. The processor **62**, the memory **64**, and the backup clock **66** of the backup controller **54** operates similarly to the processor **59**, the memory **58**, and the primary clock **60** of the primary controller **48**, respectively. The backup clock **66** may be synchronized with the primary clock **60**.

FIG. **2** illustrates an embodiment of a path (e.g., a track **80**) on which the vehicle **11** is traveling. As noted above, the vehicle **11** may travel in any suitable course with or without the track **80**. For example, the vehicle **11** may travel in an open area or in a path with pavement. The track **80** includes a pair of rails **82** that are generally parallel to each other. The wheels **32** of the vehicle **11** contact and travels on the rails **82**. The rails **82** are supported by cross beams **84**. A bus bar or energizing rail **86** is disposed on the cross beams **84** and provides electrical energy from a power source (e.g., an electrical generator) to the vehicle **11** (e.g., through an electrode attached to the vehicle **11**). The track **80** also includes a plurality of position indicators **88** (e.g., **88***a*, **88***b*, **88***c*, **88***d*). Although FIG. **2** illustrates four position indicators **88***a*, **88***b*, **88***c*, **88***d*, it is understood that the track **80** may includes any number of position indicators **88**. As noted above, the position indicators **88** allow the primary controller **48** to track the position of the vehicle **11** in the course (e.g., along the track **80**) via the primary wireless network **50**, the vehicle controller **20**, and the reader **36** of the vehicle position tracking system **34**.

Each of the position indicators **88** represents a specific position in the course. The position information (e.g., coordinates) of the position indicators **88** may be stored in the memory **58** of the primary controller **48**. Identifiers (e.g., serial numbers, sequential numbers) of the position indicators **88** may also be stored correspondingly in the memory **58**. A distance between any of the two position indicators **88** may be calculated by the processor **59** of the primary controller **48**. In operation, when the moving vehicle **11** passes (e.g., within a short distance of) one of the position indicators **88**, the reader **36** of the vehicle senses that position indicator **88**. Via the vehicle controller **20** and the primary wireless network **50**, the primary controller **48** may determine the position of the vehicle **11**. As the moving vehicle **11** passes more than one position indicators **88** at different times, which may be time stamped by the vehicle controller **20** and/or the primary controller **48**, the velocity of the vehicle **11** may be calculated and stored by the primary controller **48**. The backup controller **54** may similarly monitor the position and velocity of the vehicle **11**.

As illustrated in FIG. **2**, the position indicators **88** (e.g., **88***a*, **88***b*, **88***c*, **88***d*) are located along the track **80** and are attached on the cross beams **84**. It should be noted, however, the position indicators **88** may be placed near and on the track **80** in any suitable fashion. For example, the position indicators **88** may be attached to the rails **82**, to the ground between the cross beams **84**, or outside of the track **80**. The spacing between adjacent position indicators **88** may also be flexible depending on the requirement of the accuracy of the position determination. For example, a longer distance between adjacent position indicators **88** may result in a less accurate determination of the position of the vehicle **20** and its velocity. The position indicators **88** may be attached to the track **88** in any suitable means, including but not limited to, adhesively and mechanically. The reader **36** is typically located on the vehicle **11** to face the path (e.g., the track **80**). However, it should be appreciated that the reader **36** may be placed in any other configuration that allows the reader **36** to sense and read the position indicators **88**.

In accordance with the present disclosure, any suitable pair or set of features that provide location information may be used (e.g., a central monitoring camera and an identification element on each vehicle). For example, present embodiments may use any identification indicator in the course and a reader on the vehicle **11** that is capable of reading the indicator may be used for position tracking of the vehicle **11**. In one embodiment, the position indicator **88** includes passive or active radio frequency electronics, and the reader **36** includes a tuned antenna capable of sensing the position indicator **88**. The working frequency of the radio transmission between the position indicator **88** and the reader **36** is different from the operation frequency of the primary wireless network **50** or the backup wireless network **56** to avoid interference. In another embodiment, the position indicator **88** includes a bar code, and the reader **36** includes a bar code reader capable of physically reading the position indicator **88**. In yet another embodiment, the position indicators **88** are various marks on a scale that encodes positions, and the reader **36** is a transducer capable of sensing the various marks on the scale. For example, such a scale may be a liner encoder, and the transducer may sense the encoded positions optically, magnetically, capacitively, and/or inductively.

FIG. **3** illustrate an embodiment of a ride control system **100** including five vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11***e* (e.g., the vehicle **11** of FIG. **1**) traveling in a course **102**. The course **102** includes a track **104** (e.g., the track **80** of FIG. **2**), and the vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11***e* travel on the track **104** in a generally counterclockwise direction **106**. The course **102** also includes three show events **51***a*, **51***b*, **51***c* (e.g., the show event **51** of FIG. **1**) representing three types of show events. The show event **51***a* represents a show event with a moving show element, for example, a robot **108** moving on a show track **110**. The show event **51***b* represents a show event with projection of a motion picture to a screen **112**. The show event **51***c* represents a show event with animatronics, for example, a walking dinosaur **114**. The show events **51***a*, **51***b*, **51***c* include their respective show clocks **53***a*, **53***b*, **53***c*. It should be noted that these show events **51***a*, **51***b*, **51***c* are examples for illustrative purposes and are not meant to be limiting. It also should be noted that the course **102** illustrated in FIG. **3** is for purposes of illustration of the ride control system **100** and not meant to be limiting with regard to its elements. For example, there may be less or more than five vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11***e* in the course **102**. There may be less or more than three show events **51***a*, **51***b*, **51***c* in the course **102**. The layout of the track **80** may be different from the one illustrated in FIG. **3**.

The ride control system **100** includes the system controller **43**. The system controller **43** includes the primary controller **48** with the connected primary transceiver **46** and the backup controller **54** with the connected backup transceiver **52**. The primary controller **48** and the backup controller **54** are connected with each other via the bi-directional voting circuit **57** in the illustrated embodiment. The primary wireless network **50** includes the primary controller **48** and the five vehicle controllers **20***a*, **20***b*, **20***c*, **20***d*, **20***e*. The backup wireless network **56** includes the backup controller **54** and the five vehicle controllers **20***a*, **20***b*, **20***c*, **20***d*, **20***e*.

The primary controller **48** controls the operations of the show events **51***a*, **51***b*, **51** *c*. In addition, the primary controller **48** controls the operations of a track switch **116**. The track switch **116** is configured to switch a bridge track **118** to connect between a main path **120** (e.g., the track **104**) and an alternate path **122**. The alternate path **122** may include a maintenance station **124**. Thus, by operating the track switch **116**, a vehicle (e.g., the vehicle **11***a*, **11***b*, **11***c*, **11***d*, or **11***e*) may be directed to travel either on the main path **120** in normal operations, or on the alternate path **122** for maintenance or other purposes (e.g., to provide ride variety). The track switch **116** may be connected to the primary controller **48** in any suitable means such as hardwired, wireless, or a combination thereof. For example, the track switch **116** may include a track switch transceiver **126** connected wirelessly with the primary transceiver **46** such that the primary wireless network **50** also includes the track switch **116**.

In operation, the primary controller **48** monitors and controls the movement of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e* independently. That is, the primary controller **48** may control each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e* to have a different motion profile along the track **104**. The motion profile includes, but is not limited to, traveling at a specific speed at a specific position along the track **104**, synchronizing with a show event at a specific playing speed of the show event, whether stopping due to the overlap of blocking zones with other vehicles, whether traveling along the alternate path **122**, or any combination thereof. The following non-exclusive examples with respect to the five vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11***e* may help illustrate the operations of the ride control system **100**.

The vehicle **11***a* travels along the track **104** after passing the show event **51***a* but not approaching the show event **51***b*. An arrow **128** indicates a direction in which one or more passengers of the vehicle **11***a* face based on an orientation of the vehicle **11***a*. In this case, the arrow **128** points to the front, the traveling direction of the vehicle **11***a*. Via the primary wireless network **50**, the primary controller **48** monitors the status of the vehicle **11***a* such as the position, velocity, dynamic blocking zone, motor output power, loading condition, or the like. A front region **130** in front of the vehicle **11***a* and a back region **132** in back of the vehicle **11***a* illustrate dynamic blocking zones of the vehicle **11***a*. Likewise, the vehicle **11***c*, traveling in front of the vehicle **11***a*, has a front dynamic blocking zone **134** and a back dynamic blocking zone **136**. It should be noted that, in certain situations, a particular blocking zone (e.g., blocking zone **136**) may correspond to the boundary of a vehicle. For example, a back blocking zone for a particular vehicle or in a particular situation may be aligned with the physical rear boundary of the vehicle.

As illustrated, if the front dynamic blocking zone **130** of the vehicle **11***a* starts to overlap with the back dynamic blocking zone **136** of the vehicle **11***c*, the vehicle **11***a* is about to interfere or could be interfering with the vehicle **11***c*. Upon detecting such overlap of the dynamic blocking zones **130** and **136**, the primary controller **48** may send instructions to the vehicle **11***a* to decelerate or stop as the vehicle **11***c* is in the process of viewing the show event **51***b*. At the same time, as front and back dynamic blocking zones **140**, **142** of the vehicle **11***b*, front and back dynamic blocking zones **144**, **146** of the vehicle **11***d*, and front and back dynamic blocking zones **148**, **150** of the vehicle **11***e* do not overlap with any dynamic blocking zones of any other vehicles, the primary controller **48** may send instructions to the vehicles **11***b*, **11***d*, and **11***e* to maintain their respective movements along the track **104** without necessarily stopping them. In other situations where the dynamic blocking zones of two adjacent vehicles start to overlap, the primary controller **48** may send instructions to the front vehicle to accelerate, or send instructions to both vehicles to stop, in order to avoid interference between the two vehicles while maintaining the movement of other vehicles along the track **104**.

The vehicle **11***c*, as illustrated, is in the process of viewing the show event **51***b*. As the screen **112** is located on the right side of the track **104**, the primary controller **48** may send instructions to the vehicle **11***c* to control the passenger platform **14***c* to rotate to face the screen **112**. As discussed above, the primary controller **48** may synchronize the movement of vehicle **11***c* with the show event **51***b* using the vehicle clock **42** and the show clock **53**. For example, the show event **51***b* may simulate the feeling of watching outside of a spaceship that is flying through a galaxy with many stars. The show event **51***b* may project a short motion picture showing the flying spaceship and the stars. The vehicle controller **20***c* may control the passenger platform **14***c* to move according to the scenes of the motion picture to give the passenger the feeling of sitting in the spaceship that is flying through the stars. The movements, for example, may include rolls and yaws to simulate the spaceship making turns, tilts and surges to simulate the spaceship accelerating, and rotations to simulate the spaceship making rotational moves, etc.

The primary controller **48** may synchronize the movement of the vehicle **11***c*, such as those described above, with the images of the motion picture. Similarly, the primary controller **48** may operate to provide altered passenger viewing time relative to movement along the track **104** by rotating the ride vehicle as it passes the show event **51***b* (e.g., turning the riders toward the show event **51***b*). However, when each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e* approaches the show event **51***b*, their respective velocities may be different due to factors such as the loading condition (e.g., the weight or number of passengers). The primary controller **48** may synchronize the movement of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e* with the show event **51***b* differently. For example, the primary controller **48** may adjust the playing speed or activation of the motion picture to match the movements (e.g., traveling along the track **104** and internal movement of the passenger platform **14***c*) of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11** *e*. Alternatively, the primary controller **48** may adjust the movements of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11** *e* to match the playing speed of the motion picture during corresponding interaction times.

The vehicle **11***b*, as illustrated, is in the process of viewing the show event **51***a*. The show event **51***a* may include a sequence of movements of the robot **108** on the show track **110**. The primary controller **48** may control one or both of the movements of the vehicle **11***b* and the movements of the robot **108** for synchronization. For example, the primary controller **48** may adjust the traveling velocity of the vehicle **11***b* and/or speed of the internal movement of the vehicle **11***b* (e.g., adjusting a direction **152** of the passenger platform **14***a* relative to the base **12***a*) to match the operational speed of the sequence of the movements of the robot **108**. Similarly as described above, the primary controller **48** may synchronize the show event **51***a* with different vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11** *e* differently, such as adjusting the operational speed to different values to match the different traveling velocity of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11** *e*. As a specific example, the speed of the robot **108** along the show tack **110** may be synchronized with the speed of the vehicle **11***b* along the track **104**.

The vehicle **11***d*, as illustrated, is in the process of viewing the show event **51***c*. The show event **51***c* may include show elements involving animatronics, for example, a walking dinosaur **114**. Similar to other show events described above, the primary controller **48** may control one or both of the movements of the vehicle **11***d* and the movements of the dinosaur **114**, including any other special effects (e.g., sound, visual, water, pneumatic), for synchronization. The synchronization may also be adjusted with respect to each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e*.

The vehicle **11***e*, as illustrated, is approaching the track switch **116**. The primary controller **48** may monitor the status of the vehicle **11***e* to determine if the vehicle **11***e* takes the main path **120** or the alternate path **122**. The determination may depend at least on factors such as the maintenance status of the vehicle **11***e*, spacing between the vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11** *e*, etc. The primary controller **48** may determine the maintenance status of the vehicle **11***e* based on a trend of loading conditions or motor output power. As discussed above, the vehicle controller **11***e* may record data regarding the status of the vehicle **11***e*, such as the loading condition and the motor output power, over a period of time. Such data may be transferred to the primary controller **48** via the primary wireless network **50**. The primary controller **48** may compare the collected data to a pre-determined threshold of loading conditions or motor output power to determine whether the vehicle **11***e* should be scheduled for maintenance. For example, the primary controller **48** may calculate the total loading condition of the vehicle **11***e* by, for example, multiplying the loading weight per run with the number of runs during the period, and then comparing the total loading condition to a threshold. If the total loading condition is greater than the threshold, the vehicle **11***e* should be maintained. Otherwise, the vehicle **11***e* does not need maintenance. However, it should be contemplated that any suitable method may be used by the primary controller **48** to determine the maintenance status of the vehicle **11***e*. Because the operational history, such as loading conditions or motor output power during a period of time, may vary among the vehicles **11***a*, **11***b*, **11***c*, **11***d*, **11** *e*, the primary controller **48** may provide individualized analysis and determination of the maintenance status of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e*.

Furthermore, the primary controller **48** may provide predictive maintenance optimization for each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11** *e*. As described above, the primary controller **48** may record and analyze the maintenance status of each vehicle **11***a*, **11***b*, **11***c*, **11***d*, **11***e* during a period of time. Based on such a trend, the primary controller **48** may predict when the next maintenance will be. For example, in the above example, the primary controller **48** may calculate the difference between the threshold and the total loading condition of the vehicle **11***e*, and divide that difference by the average loading weight per run to estimate the number of runs before the next maintenance. The primary controller **48** may additionally provide reminder messages regarding the due time of the next maintenance.

After determining the maintenance status of the vehicle **11***e*, the primary controller **48** may control the track switch **116** to correspondingly direct the vehicle **11***e* to either the main path **120** or the alternate path **122**. For example, if the vehicle **11***e* should be maintained, the primary controller **48** may control the track switch **116** to connect the bridge track **118** with the alternate path **122** such that the vehicle **11***e* may enter into the maintenance station **124**. After the vehicle **11***e* has entered into the alternate path **122**, the primary controller **48** may control the track switch **116** to switch the bridge track **118** back to be connected with the main path **120**. During such process, the primary controller **48** may direct other vehicles to maintain their respective operational status without being affected by the vehicle **11***e*.

FIG. **4** illustrates a method **160** for monitoring and controlling a plurality of vehicles **11** within a course in accordance with the present disclosure. The method **160** includes reading from position indicators **88** within the course (block **162**) by each of the plurality of vehicles **11** or a central monitor to determine the position and velocity of the respective vehicle **11** (block **164**). Other data indicative of the status of each of the plurality of vehicles **11** may also be determined, such as the motor output power, the loading condition, and so forth.

The data indicative of the status of each of the plurality of vehicles **11**, including the position and the velocity, may then be transferred to the primary controller **48** and the backup controller **54** via the respective primary wireless network **50** and the backup wireless network **56** (block **166**). The primary controller **48** is connected with the backup controller **54** via the bi-directional voting circuit **57**. The bi-directional voting circuit **57** is configured to compare the two sets of data (e.g., position data, or velocity data) of each of the plurality of vehicles **11** received by the primary controller **48** and the backup controller **54**, respectively. The bi-directional voting circuit may then determine a correct or more accurate set of data (block **168**). The bi-directional voting circuit may include a processor or circuitry configured to perform an algorithm that analyzes data integrity and reliability based on historical data or predictive calculations or merely based on availability. For example, the bi-directional voting circuit may operate to select data for use based on it being available and uncorrupted (e.g., within predefined value limits).

Based on the determined data, the primary controller **48** sends instructions to each of the plurality of vehicles **11** to control the movement of each of the plurality of vehicles **11** independently (block **170**). The movement includes the external movement of each of the plurality of vehicles **11**, such as running and stopping within the course. The movement also includes the internal movement of each of the plurality of vehicles **11**, such as roll, tilt, and yaw of the respective passenger platform **14** with respect to the respective base **12** of each of the plurality of vehicles **11**. For example, the position tracking system **34** or an additional position tracking system may be configured to facilitate identification of a first vehicle component (e.g., a rotatable seating area) location with respect to a second vehicle component (e.g., a base relative to which the rotatable seating area moves). The primary controller **48** may be configured to control a show event based on the first vehicle component location. The primary controller **48** may be configured to control the first vehicle component based on a show event status. Further, the primary controller **48** may direct a first vehicle of the plurality of vehicles **11** to decelerate or stop if the primary controller **48** determines the dynamic blocking zone of the first vehicle starts to overlap with the dynamic blocking zone of a second vehicle traveling in front of the first vehicle. At the same time, the primary controller **48** may direct other vehicles of the plurality of vehicles **11** to maintain their respective motion files.

The primary controller **48** also controls the operations of the one or more show events **51** within the course. In accordance with the present disclosure, the primary controller **48** may independently synchronize the movement of each of the plurality of vehicles **11** with the one or more show events **51** (block **170**). The synchronization may depend on at least the status of each of the plurality of vehicles **11**, such as traveling velocity and loading condition.

Relative to traditional systems, present embodiments may operate to reduce complex wiring, limit the number sensors, facilitate integration, and reduce maintenance costs. Further, present embodiments facilitate independent control of the movement of individual ride vehicles in a single course. Also, present embodiments facilitate synchronization of individual ride vehicle with show events. For example, when a ride vehicle has a smaller load, which might make it travel faster, present embodiments can either adjust the speed for that particular vehicle or otherwise adjust show events to accommodate the difference without impacting other ride vehicles. Present embodiments also facilitate dynamic adjustment of vehicle spacing, determination of vehicle loading, and maintenance scheduling.

While only certain features have been illustrated and described herein, many modifications and changes will occur to those skilled in the art. It is, therefore, to be understood that the appended claims are intended to cover all such modifications and changes as fall within the true spirit of the disclosure.

The invention claimed is:

1. A ride control system, comprising:
 a plurality of ride vehicles positioned within a course and configured to travel within the course, wherein each of the plurality of ride vehicles comprises:
  a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles;
  a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course; and
  a vehicle transceiver in communication with the vehicle controller;
 a primary controller;
 a primary transceiver in communication with the primary controller;
 a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles, wherein the primary controller is configured to receive data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network and wherein the primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on the data indicative of the location of each of the plurality of ride vehicles;
 a backup controller configured to receive the data indicative of the location of each of the plurality of ride vehicles from the respective ones of the plurality of ride vehicles via the primary wireless network, wherein the primary controller is configured to control one or more show elements and the backup controller is not; and
 a bi-directional voting circuit configured to select between the data received by the primary controller and the backup controller.

2. The ride control system of claim 1, wherein the position tracking system of each of the plurality of ride vehicles respectively includes a reader in communication with the controller of the respective ride vehicle, the reader configured to read position indicators.

3. The ride control system of claim 2, wherein the vehicle controller is configured to determine a location of the respective one of the plurality of ride vehicles based on data provided from the reader based on reading at least one position indicator.

4. The ride control system of claim 1, comprising a plurality position indicators located throughout the course, each of the position indicators corresponding to a specified location within the course.

5. The ride control system of claim 1, wherein the primary controller is configured to transmit instructions to each of the plurality of ride vehicles based on accumulated location information from all or a subset of the plurality of ride vehicles.

6. The ride control system of claim 1, wherein the primary controller is configured to control a show event on or proximate to the course based on the data indicative of the location of each of the plurality of ride vehicles.

7. The ride control system of claim 1, wherein the primary controller is configured to determine a maintenance status of the respective one of the plurality of ride vehicles based on a trend of operation for the respective one of the plurality of ride vehicles.

8. The ride control system of claim 1, wherein the primary controller is configured to receive a first location of a first ride vehicle and a second location of a second ride vehicle and to generate instructions based on the first and second locations for transmission to the vehicle controller of the first ride vehicle for controlling the movement of the first ride vehicle in a manner that differs from the second ride vehicle.

9. The ride control system of claim 1, comprising additional ride vehicles in communication with the primary controller via the primary transceiver, wherein the primary controller and primary transceiver are integral.

10. The ride control system of claim 1, wherein the primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide dynamic spacing buffers between ride vehicles.

11. A ride control system, comprising:
 a plurality of ride vehicles positioned within a course and configured to travel within the course, wherein each of the plurality of ride vehicles comprises:
  a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles;
  a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course; and
  a vehicle transceiver in communication with the vehicle controller;
 a primary controller;
 a primary transceiver in communication with the primary controller; and
 a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles, wherein the primary controller is configured to receive data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network and wherein the primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on the data indicative of the location of each of the plurality of ride vehicles, wherein the position tracking system is configured to facilitate identification of a first vehicle component location with respect to a second vehicle component, wherein the primary controller is configured to control a show event based on the first vehicle component location.

12. The ride control system of claim 11, wherein the first vehicle component includes a rotatable seating area and the second vehicle component includes a base relative to which the rotatable seating area moves.

13. The ride control system of claim 11, wherein the primary controller is configured to control the first vehicle component location based on a show event status.

14. A ride control system, comprising:
 a plurality of ride vehicles positioned within a course and configured to travel within the course, wherein each of the plurality of ride vehicles comprises:
  a vehicle controller configured to control movement of a respective one of the plurality of ride vehicles;
  a position tracking system configured to facilitate identification of a location of the respective one of the plurality of ride vehicles within the course; and

a vehicle transceiver in communication with the vehicle controller;

a primary controller;

a primary transceiver in communication with the primary controller;

a primary wireless network formed by the vehicle transceiver and the primary transceiver to include at least the primary controller and the vehicle controller of each of the plurality of ride vehicles, wherein the primary controller is configured to receive a first set of data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the primary wireless network;

a backup controller in communication with the primary controller;

a backup transceiver in communication with the backup controller;

a backup wireless network formed by the vehicle transceiver and the backup transceiver to include at least the backup controller and the vehicle controller of each of the plurality of ride vehicles, wherein the backup controller is configured to receive a second set of data indicative of the location of each of the plurality of ride vehicles from respective ones of the plurality of ride vehicles via the backup wireless network; and

a bi-directional voting circuit configured to compare the first set of data and the second set of data, and to select between the first set of data and the second set of data, wherein the primary controller or the backup controller, and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide a control loop for each of the plurality of ride vehicles based on one of the first set or the second set of data indicative of the location of each of the plurality of ride vehicles.

15. The ride control system of claim **14**, wherein the primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide the control loop for each of the plurality of ride vehicles based on the first set or the second set of data.

16. The ride control system of claim **14**, wherein the primary controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide the control loop for each of the plurality of ride vehicles based on the first set of data when the bi-directional voting circuit selects the first set of data, and the backup controller and the vehicle controller of each of the plurality of ride vehicles are configured to coordinate to provide the control loop for each of the plurality of ride vehicles based on the second set of data when the bi-directional voting circuit selects the second set of data.

17. The ride control system of claim **14**, wherein one of the primary controller or the backup controller is configured to control a show event on or proximate to the course based on one of the first set or the second set of data indicative of the location of each of the plurality of ride vehicles.

18. The ride control system of claim **14**, wherein one of the primary controller or the backup controller is configured to determine a maintenance status of the respective one of the plurality of ride vehicles based on a trend of operation for the respective one of the plurality of ride vehicles.

19. A method for controlling a plurality of ride vehicles within a course, comprising:

identifying a location of each of the plurality of ride vehicles;

transmitting the location of each of the plurality of ride vehicles to a system controller via a primary wireless network, wherein the primary wireless network includes the system controller and a vehicle controller of each of the plurality of ride vehicles;

transmitting the location of each of the plurality of ride vehicles to a backup controller via a backup wireless network, wherein the backup wireless network includes the backup controller and a vehicle controller of each of the plurality of ride vehicles;

selecting one selected location from the location received by the system controller and the location received by the backup controller with a bi-directional voting circuit; and

controlling, with the system controller, a movement of each of the plurality of ride vehicles based on the one selected location.

20. The method of claim **19**, comprising controlling, with the system controller, a show event on or proximate to the course based on the selected location of a particular one of the plurality of ride vehicles.

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